

# Modeling an automated drone inspection as a Petri net

*Robot behavior* generally refers to the *business logic* that is implemented in the robot's software that makes the robot do things (fly somewhere, take a photo, etc.). Executing small tasks in the right order allows us to execute more complex tasks automatically. When the behavior is simple, it can be directly embedded into code using simple programming-constructs such as *if-else* statements. However, once there is a large number of tasks, or certain tasks have a dependency on other tasks or we require particular tasks to run in parallel, it can quickly become a jungle of nested logic.

Separating behavior from implementation is a common theme in software and robotics. Concepts such as *finite state machines* (FSMs) or *behavior trees* are examples in which a graphical language is used to express behavior separate from the programming code. In this internship we will use Petri nets, another graphical language, to model our Drone's behavior. Petri nets originally were intended as diagrams for chemical reactions, but they have found their way into computer science and mathematics with a much broader application. They are a generalization of FSMs (a FSM is a special type of Petri net) and have a much stronger formal mathematical basis compared to behavior trees.

The goal of the internship is to design a Petri net that is similar or equal in behavior to our current behavior tree, which models an autonomous drone inspection. The resulting Petri net can be analyzed for interesting properties and compared to our current behavior tree. Ideally, we will also try to execute the designed Petri net (or parts of it) on a real drone.

Relevant reading material:

- <http://petrinet.org/> (interactive examples)
- [https://en.wikipedia.org/wiki/Petri\\_net](https://en.wikipedia.org/wiki/Petri_net) (a very good wiki page!)
- [http://mlwiki.org/index.php/Petri\\_Nets](http://mlwiki.org/index.php/Petri_Nets) (similar, but less elaborate)

## About Mainblades

Mainblades is an innovative company located in The Hague which develops automated aircraft inspections, automating the whole process from visual drone inspection up to report-generation. We are looking for a student whose curiosity is triggered by this internship. Ideally the candidate is a master-student with some programming experience, familiar with Linux and a general hands-on mentality. The duration of the internship can be 3 to 4 months and the starting date is flexible. This is a paid internship with a monthly compensation of €500.

**In order to apply, please supply:**

- A recent CV with relevant experience
- A short description about yourself
- A little assignment: design your first (*simple!*) Petri net
  - it can be about anything (see the interactive examples link for inspiration), don't make it too big
  - you can draw it using pen and paper, on the computer, or use special software for it. Just attach a picture of the Petri net to your internship application
  - add a little description of what process the net represents

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